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(19) (CA) **CANADIAN PATENT** (12)

(54) Combustible Compositions

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ABSTRACT OF THE DISCLOSURE

A combustible composition comprising a fuel in the form of a wax, gel or paste having expanded perlite dispersed therein serving to decrease the rate at which the fuel burns on combustion of the composition and optionally a combustible filter material, the composition being such that it does not flow substantially during combustion.

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The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A combustible composition comprising a fuel in a form selected from the group consisting of waxes and pastes and having expanded perlite dispersed therein serving to decrease the rate at which the fuel burns on combustion of the composition, the composition being such that it does not flow substantially during combustion.
2. A combustible composition as claimed in claim 1 comprising a compacted mixture of a combustible organic solid, wax, and expanded perlite.
3. A combustible composition as claimed in claim 2 wherein the said combustible, organic solid is selected from the group consisting of wood waste, peat, waste plastics, coal fines, lignite, comminuted waste paper, cardboard, and comminuted plant material.
4. A combustible composition as claimed in claim 2 further comprising a combustible liquid.
5. A combustible composition as claimed in claim 1 comprising a gelled fuel, a combustible organic solid and expanded perlite.
6. A combustible composition as claimed in claim 5 wherein the said combustible, organic solid is selected

Claim 6 continued...

from the group consisting of wood waste, peat, waste plastics, coal fines, lignite, comminuted waste paper or cardboard, comminuted plant material.

7. A combustible composition as claimed in claim 1 and comprising expanded perlite and a water immiscible fuel emulsified with water to form a stiff paste.

8. A combustible composition as claimed in claim 1 wherein the expanded perlite has a bulk density of 40 to 60 kg/m³ and has a particle size of 0.8 mm or less.

9. A combustible composition as claimed in claim 1 containing from 1 to 6% by weight of expanded perlite.

10. A combustible composition as claimed in claim 1, in a form selected from the group consisting of firelighter blocks, sachets, filled tubes, and firelogs.



1 FIELD OF THE INVENTION

 The present invention relates to combustible
compositions and includes compositions which in relatively
small pieces are useful as firelighters as well as
5 compositions which may be used to make artificial firelogs.
The compositions of the invention may also be used as fuel.

BACKGROUND OF THE INVENTION

 Known combustible compositions include those
compositions which are used as firelighters, charcoal
10 igniters and artificial firelogs. Certain of these
compositions comprise fuel in the form of a wax, gel or
paste, optionally filled with organic, combustible solids
such as wood waste, (e.g. wood flour or wood shavings).

 United States Patent Specification No. 4,165,968
15 discloses a gelled alcohol containing expanded perlite for
the special purpose of forming a thin surface coating on
charcoal briquettes to make them easily lightable. This
alcohol gel composition would not be suitable for use in
bulk as a firelighter because it would flow during
20 combustion producing a large burning surface area and hence
burning for only a short period. The purpose of the
expanded perlite in the composition is to give the coating
in charcoal a rough surface which acts as a wick to give
easy ignition, rapid flame spread and hence an increased
25 rate of fuel consumption.

 We have found that the incorporation of inorganic
solids into certain compositions which do not flow during



1 combustion, and which therefore are themselves useful as
fuel, firelighters or barbeque starters, can produce a
decrease in rate at which the fuel content of the
combustible composition is consumed.

5 BRIEF DESCRIPTION OF THE INVENTION

The present invention now provides a combustible
composition comprising a fuel in the form of a wax, gel or
paste having expanded perlite dispersed therein serving to
decrease the rate at which the fuel burns on combustion of
10 the composition and optionally a combustible filler
material, the composition being such that it does not flow
substantially during combustion.

The fuel in wax, gel or paste form may for
instance be an animal, mineral or vegetable wax, a gel formed
15 from a combustible liquid or liquefiable material, e.g. a
hydrocarbon such as kerosene or an alcohol, or a paste
formed by emulsifying an oil in water.

DETAILED DESCRIPTION OF THE INVENTION

The combustible composition may accordingly com-
20 prise a compacted mixture of a combustible organic
solid, such as wax, wood waste, and the expanded perlite.
The wax which serves to bind such a composition together
may be a solid or semi-solid wax. The composition may
optionally contain a combustible liquid such as kerosene,
25 distillate, gas oil, white spirit, sump oil or oils of
vegetable origin such as may be used in the paints and
plastics industries, and/or oils or fats of animal origin.

- 1 Other fuel materials which may optionally be included from
the plastics industry include waste polymers such as atactic
polypropylene.

Compositions of the above type may be formed into
5 large pieces suitable as artificial firelogs..

A further type of combustible composition according
to the invention may comprise as well as the inorganic
solid a gelled combustible liquid, e.g. a liquid hydro-
carbon such as kerosene and/or vegetable or animal derived
10 oils. The liquid may be gelled by means of a suitable
thickener such as metal soap including aluminium stearates
and octanoates, carboxymethyl cellulose, hydroxymethyl
cellulose, hydroxypropyl cellulose, nitrocellulose, gums
such as xanthan, arabic, tragacanth, shellacs, rosin,
15 lignosulphates, tall oil cuts, quebracho extracts, caseinates,
gelatin, higher alcohols, synthetic polymers such as
polybutanols, ethylene copolymers, polyvinyl alcohols,
polyvinyl acetate, vinyl cellulose, polyketones, polyesters,
phenoxy resins, polymeric diols, vinyl butyral resins,
20 vinyl acetate/polyvinyl chloride copolymers, N-cocohydroxy-
butyramide, polyamides and inorganics such as silica
xerogel (known as "fumed silica"), thickening clays such
as bentonite, laponite, montmorillonite and mixtures
thereof. The gelling agent is selected such that the
25 composition will not flow during combustion to a signifi-
cant extent. The composition may contain a combustible
organic solid such as wood waste peat or plastics waste.

1 Waxes may be incorporated into such compositions to act
as additional fuel and in some cases to help bind the
composition. Conventional products of this general type
but lacking the expanded perlite characteristic of the
5 invention are known as "brown firelighters".

Examples of compositions according to the
invention include an alcohol gelled by the use of a thick-
ener as described above, e.g. soap and/or silica xerogen
(known as "fumed silica") as the fuel in combination with
10 the inorganic solid. Kerosene or other hydrocarbon fuel
or other oil may be used in place of the alcohol.

A further type of composition according to the
invention may comprise the expanded perlite and a water-
immiscible fuel e.g. hydrocarbon oil or other oil,
15 emulsified with water to form a stiff paste, e.g. by the
action of suitable emulsifying agents optionally in
conjunction with application of high shear which has the
effect of thickening the emulsion. Such an emulsion
serves to provide the fuel in paste form.

20 Examples of inorganic, non-combustible particulate
materials which may be used in conjunction with the expanded
perlite are chalk, china clay, diatomaceous earth, perlite
rock, sand, FILLITE which is a particulate solid separated
from boiler ash and has the form of microspheres,
25 vermiculite, talc, and exfoliated vermiculite.

Preferably, such an inorganic non-combustible
particulate solid has low bulk density, for example less
than 0.4 g.cc^{-1} .

1 Preferably, the density of any such inorganic
non-combustible particulate solid is similar to or less
than that of the liquefiable fuel component. . More pre-
ferably, the density of the solid is much less than that of
5 the liquefiable fuel component.

 Preferably, the particles of the expanded perlite
and other inorganic non-combustible solids if present are
impermeable to liquids, that is to say, the liquefiable fuel
cannot completely penetrate the interior of the
10 particles. This may be achieved by the use of solids that
have a liquid-impermeable "skin" such as FILLITE, or by
coating the particulate material with a barrier material
which may be a polymeric coating composition such as an
alkyd resin or nitro cellulose or a heavy metal soap, a
15 silicone, or a silicate, or a viscous non-drying oil or
a drying oil.

 In order to minimise the opportunity for the
expanded perlite to absorb liquid fuel it is preferred that
the expanded perlite be added to the other ingredients
20 shortly before the composition becomes too stiff to allow
the introduction of the perlite.

 It is preferred that the expanded perlite be of
relatively small particle size, e.g. about 0.8 mm or less
and of relatively low bulk density, e.g. from 40 to
25 60 kg/m³. Johns Manville grade EUP/100/28 is of this
preferred type.

1 The amount of expanded perlite that may be included is up to 12% w/w of the total composition. Preferably, the amount is less than 8% w/w and 1% to 6% w/w is especially preferred.

5 The combustible composition may contain, in addition to the expanded perlite a proportion of combustible particulate material uniformly distributed therein. Typical of such materials are:- wood wastes including wood flour, wood shavings or comminuted compressed wood wastes;
10 peat in dried native or dried and comminuted, precompressed form; coal fines; lignite; waste paper or cardboard; comminuted plant material such as comminuted compressed wastes from grain crops optionally partly hydrolysed, seeds such as linseed, rapeseed and millet which may be used whole
15 or crushed, including oil-mill waste, or seed hulls such as coconut husk, walnut shells and peach stones preferably in comminuted form; or mixtures thereof. All things which contribute significantly to the calorific value of the end product be it firelighter, barbeque starter or artificial
20 firelog may be used.

 Generally, the proportion of such combustible solid material in the compositions of the invention will not exceed 80% by weight and more preferably will not be more than 70% by weight.

25 Preferably, the amount of expanded perlite included does not exceed 12% w/w based on the final product. In those cases where a particulate organic combustible material

1 is included, the amount of inorganic solid preferably
does not exceed 8% w/w by weight of the final composition
and is preferably 0.5% to 6% w/w.

5 The composition according to the invention may
generally be used as firelighters or charcoal igniters.
Those compositions which are not self-supporting solids may
be put up in sachets to provide unit doses or may be filled
into collapsible tubes for dispensing in such doses as
are desired.

10 Those compositions possessing sufficient structural
integrity may suitably be made into artificial firelogs.

The composition of the invention may be prepared
in a variety of ways depending upon whether the final pro-
duct is to be used as an ignition product for fires on the
15 one hand or barbeque starters on the other hand or an
artificial firelog. The manufacture of such product types
is well understood and the incorporation of the expanded
perlite may be effected by mixing at a suitable stage
depending upon whether the final composition is to include
20 a mechanical mixture of fuel and solid organic combustible
material, a gelled fuel without wood waste or a brown
firelighter type of product.

If the final product is to be of the first type,
the expanded perlite, and any other inorganic materials,
25 optionally precoated with surface treatment material, may
be admixed together with or separately from the solid
organic combustible material into the fuel with stirring

1 usually at slightly elevated temperature especially in
those cases where a relatively high melting point fuel is
employed. In some cases it may be suitable to slurry the
inorganic material optionally admixed with the fuel in
5 liquid form and introduce them as fluid into the final
blend.

Where the final product is to be a gelled product,
preferably the gel is formed first from suitable components
that is a thickener such as fumed silica or a soap and a
10 fuel component in liquid form, for example an alcohol or
kerosene. The inorganic component may then be admixed
therewith with stirring to achieve uniform distribution.
However, the inorganic solids may be dispersed in the fuel
whilst it is in liquid form and then the mixture may be
15 gelled by addition of soap or its formation in situ. It
has been observed that the final product is often of stiffer
consistency than the initially formed gel.

Preferably, when soap is used for the gelling, the
soap is a saturated one since these give firmer gels.
20 An Example of a preferred material is sodium stearate.
Heavier metal soaps such as aluminium stearate may
additionally or alternatively be used. The fuel does not
have to be normally liquid and materials such as slack wax
may be gelled with soap. Preferred proportions of fuel
25 and soap are 3 to 25% by weight soap, more preferably 8
to 15% by weight soap, based on the weight of fuel and
soap.

1 In the case of a brown firelighter type of final
product where, for example kerosene or other combustible
liquid is gelled as with a soap and mixed with wood waste
to achieve a shape-retaining final solid that may be cut
5 into blocks or moulded, the expanded perlite may be mixed
with the gelling fuel component. Alternatively, the
expanded perlite may be mixed with the fuel in liquid
form and the mixture may be gelled by addition of soap or
formation of soap in situ. The freshly formed composition
10 may be allowed to stand until of satisfactory consistency
if it is desired to be cut into blocks subsequently.
Alternatively, the mixture may be moulded into individual
blocks and wrapped when set to handlable consistency.

 Another means of presenting the product is in
15 sachets, i.e. sealed envelopes which closely fit the
outer surfaces of the blocks when set.

 Where such a composition is to be used as an
artificial firelog suitably large pieces may be moulded
as by extrusion or compaction and optionally wrapped.

20 Combustible compositions of the present invention
are preferably match ignitable.

EXAMPLES

 The invention will now be illustrated by the
following Examples in which parts are by weight:-

25 Example 1

 A kerosene-soap gel containing wood waste and
expanded Perlite (Johns Manville Grade EUP/100/28) was

1 prepared by heating a mixture of 72 parts kerosene and
10 parts stearic acid to 50°C until all the acid was
dissolved using a propeller mixer.

3 parts of a 50% aqueous sodium hydroxide was then
5 dissolved in the solution with stirring. To 83 parts of
this mixture 17 parts premixed wood flour (15 parts) and
expanded Perlite Grade EUP/100/28 (2 parts) were added in
a dough mixer to mix with the above solution uniformly.
The resultant suspension was poured into moulds and
10 lightly tamped with a pallet knife and left overnight to
set.

Firelighter sized fingers were cut from the block
and had weight 40.0 g and size 30.5 x 62.5 x 28 mm.

Burning tests were conducted upon the firelighters
15 so-produced in quadruplicate and a control lacking the
perlite was run.

	<u>Control</u>	
Level of perlite present	None	2%
Mean finger weight	36.7 g	33.4 g
20 Mean observed burning time	12.0 min	16.7 min
%age kerosene in test sample	72.0	70.0
Weight kerosene per gram of finger	26.42 g	23.34 g
Burning time per g of kerosene	0.45 min	0.72 min

25 Thus the burning characteristics of brown fire-
lighter fingers containing 2% expanded perlite are not
impaired. Indeed a reduction of 9% in density results, an

- 1 increase in observed burning time occurs and the kerosene
is more efficiently utilised.

Example 2

- 5 A typical artificial firelog composition was
prepared by melting 72 parts SLACKWAX 30* and admixing
with slow stirring 28 parts of a mixture of sawdust (26 parts)
and expanded Perlite EUP/100/28 (2 parts) until uniform
distribution was achieved.

- The mixture was pressed into a mould as used in
10 Example 1 and left to harden. Burning tests were con-
ducted on fingers, cut from the moulded block when cold
as in Example 1, for convenience and a control lacking
perlite was run.

		<u>Control</u>	
15	Level of perlite present	None	2%
	Mean finger weight	44.6 g	37.2 g
	Mean observed burning time	19.6 min	18.8 min
	%age slackwax in sample	72.0	70.0
	Weight slackwax per g of finger	32.11 g	26.04 g
20	Burning time per g of slackwax	0.61 min	0.72 min

- The inclusion of this grade of expanded perlite
at 2% w/w level was found to reduce the density of the pro-
duct by about 16% compared with the control; the observed
25 burning time is not significantly impaired, however, the
efficiency of utilisation slackwax is improved. Both
products tended to drip slackwax slightly and were difficult
to ignite with a match.

*Trade Mark

1 A consideration of the above Examples show
that the compositions of the invention tested exhibit
various surprising advantages over the controls.

5 First it has been found that a large reduction in
density of the combustible composition may result from the
addition of expanded perlite. Thus, in the case of a
wax/wood waste composition (Example 2) up to 9% reduction
in density occurs in blocks suitable for artificial fire-
logs and containing little or no kerosene whilst the
10 observed burn time (duration of burn in minutes per unit
size of block of material) seems not to be reduced
indicating an improvement in the efficiency in the utilisation
of the liquefiable fuel per unit-volume of product.

15 The reduction in density is in itself advantageous
since the bigger product may be produced without using
extra fuel or the existing size of product may be maintained
with a fuel saving.

20 The corresponding reduction in density of an
ignition product for use as a firelighter and prepared
from an otherwise typical brown firelighter composition
(Example 1) is roughly 9% on addition of 2% w/w expanded
perlite and the observed burning time was substantially
increased emphasising the increased efficiency of
burning of the liquefiable fuel of incorporation of
25 relatively low concentration of expanded perlite.

 Whilst in many cases the incorporation of expanded
perlite improves the efficiency of burning of the fuel,

1 it is at present not clear how this effect is achieved.
It could be due to the structure of the expanded perlite.
In the case of the more solid compositions, the perlite
may merely provide a more or less rigid structure within a
5 burning block preventing the slight shrinkage effect
which normally accompanies collapse of the block during
burning, with consequent improvement of burning. Solid
blocks exemplified above show an efficiency of fuel
burning which tends towards the efficiency of so-called
10 "white firelighter" in burning liquefiable fuel.

"White firelighter" is the term usually used
for a firelighter composition having kerosene in liquid
form encapsulated in tiny pores in a matrix of solid
resin.

15 Again it may be due to a heat insulative effect
of the perlite causing reduced heat flow to the fuel
in the interior of the block resulting in a reduced rate
of vaporisation at the burning surface, or some combination
of these effects.

20

SUBSTITUTE
REMPLACEMENT

SECTION is not Present
Cette Section est Absente